are not explained by the theory of Wislicenus and van 't Hoff (*Journ. Prac. Chem.* 1895, [2], lii, 365–372); but, as was shown in the celebrated controversy with Fittig (*Liebig's Ann.* 1892, cclxxii, 1-99) over the brom-additive products of angelic and tiglic acids, the conditions of the experiment play such an important part in determining the nature of such reactions that the bearing of the results on the validity of the theory must be accepted with a certain amount of reservation. The matter is still the subject of discussion; for the present we can only quote the words of an illustrious chemist, who said that "unter allen sonst vorgebrachten Erklärungs-versuchen lehrt kein einziger auf gleich einfach und gleich umfassende weise die beobachteten Thatsachen verstehen."

Wislicenus has of late been engaged in the application of the theory of spacial relations to the formation of ring compounds, his synthesis of cyclo-pentanone from the calcium salt of adipic acid serving as a starting point in the preparation of the simplest five-ring compounds. Especial interest attaches to the investigation of suberone, which was shown to be a seven carbon ring; for the theoretical consideration of von Baeyer (*Ber.* 1885, xviii, 2277), in addition to those already referred to, would make us regard a seven carbon ring as unstable as a four.

Wislicenus is one of the forty foreign members of the Royal Society, and was awarded the Davy medal in 1898. Still working with all the vigour of an enthusiast, lecturing both in summer and winter at eight o'clock, making frequent tours through the research laboratories with his note-book and cigar, and listening patiently to the "Ausländer" who bury their unsuccessful experiments in the mysteries of the German language, he attracts students of every nationality, for he has a personality which makes its influence felt; and those who have enjoyed the privilege of working under him have lost none of their respect for a distinguished teacher in their appreciation of his kind hospitality and generous spirit.

THE CENTENARY OF THE DISCOVERY OF CERES.

A HUNDRED years have passed since Piazzi, at Palermo, opened a new era in observational astronomy by the discovery of the first of the many small planets that circulate between the orbits of Mars and Jupiter. This welcome, but not unexpected, addition to the known members of the solar system gave an increased interest to the routine of observation, supplied fresh reasons for the preparation of accurate star catalogues, and quickened the researches of practical astronomy, a little overshadowed by the brilliancy of the results won on the physical side by the French mathematicians of the last century. It is true that within the space of time which has elapsed since Piazzi used to such good purpose the altazimuth of Ramsden, the history of astronomy has had to record, not only the growth, but also the decrease, of interest which has been a consequence of the rapid discovery of similar objects. Nevertheless, Piazzi's discovery was fortunate and fructiferous, and we willingly associate ourselves with those of his countrymen who have recently sought to do honour to his memory and to demand due recognition for his services. We are reminded, in a recent number of *Memorie della Societa degli Spettroscopisti Italiani*, that though the story of the discovery of Ceres may have been frequently told and is very well known, yet there are features connected with it of which we may well be reminded. For eight years with untiring diligence did Piazzi patiently work, before he made the discovery which has rendered his name a household word and endeared his memory among his countrymen. Doubtless he himself considered his star catalogue a far greater work, and so posterity will esteem it; but the renown that attaches to such a discovery is immediate and, in a sense, abiding. To appreciate fully what it meant at the time, we must recall the confidence and the agitation which were connected with the so-called Bode's law. The evidence such a formula offered of the existence of an undiscovered planet may not appear now very convincing, but the confidence with which it had been received had been strengthened by the comparatively recent discovery of Uranus, and astronomers, among whom may be reckoned Schrœter and De Zach, were banded together with the firm determination to discover the missing link in the chain of planetary distances. Piazzi, according to Grant, stood outside this company of eager astronomers, but the late Admiral Smyth, who had exceptional information from his personal acquaintance with Piazzi, gives him a place in the circle. In any case it was due to systematic work diligently pursued by the Palermo astronomer that the prize was won.

But, as pointed out by Prof. Angelitti and others who have taken part in the centennial celebrations, the indirect results of the discovery have far outweighed the immediate. Among these may be reckoned the earlier publication of the "Theoria Motus" of Gauss, and especially those chapters which deal with the computation of an elliptic orbit from observations that embrace only a short interval of time. This classical work has remained for a century, the model on which all similar calculations have been based. Alterations of detail have been introduced from time to time bearing upon special parts of the work, but practically the method followed to-day is the method that Gauss evolved to rescue and identify the discovered planet of Piazzi from the stars by which it is surrounded and which it so much resembles. It is well known that Ceres, as the small planet was called, was followed by Piazzi only from January 1 to February 11. Oriani and Bode, to whom Piazzi forwarded his observations, do not appear to have seen the planet in the first year of its discovery, and Gauss' researches and the success that attended them rest entirely on the labours of the original discoverer.

It is not out of place to recall how the discovery of small planets and the eagerness with which they were sought in the middle of last century gave a great impetus to the construction of accurate maps of the heavens. The Berlin charts led to the ready recognition of Neptune, while the ecliptic charts of Hind, of Peters, of Chacornac and of a host of others who engaged in the work, added greatly to our knowledge of the configuration of the heavens and the arrangement of the stellar universe. And it must be remembered that one of the first, if not the first, valuable application of photography to astronomy had for its aim the rapid delineation of such charts originally devised for the detection of small planets. To the fruitfulness that has followed this peculiar direction of thought it is not necessary to refer more particularly, but it would not be difficult to show that the discovery of small planets, originating in the small observatory of Palermo, has exercised an enormous influence on the methods of observation now so generally pursued.

We need do no more here than barely refer to the important part that the group of small planets has played in the oldest of old problems, that of the distance of the Sun. Let the bulky volumes that Sir David Gill has sent from the Cape speak of the work that small planets have furnished to the astronomer in this chapter of his science. And now, practically a century after Piazzi taught us how the space between Mars and Jupiter is crowded with cosmical matter, we find astronomers of all nations cooperating on the systematic observation of one of these small bodies, only intent upon bringing the new material to aid more efficiently in the serivce of the old. Small planets have played, and in the future will continue to play, a part in the onward progress of astronomy, and

for this reason we think Italian men of science are well advised to insist upon the recognition of the services of their famous countryman, and they may be assured that all who value solid work diligently performed will give a grateful thought to the unostentatious astronomer of Palermo, who devoted himself with skill and patience to the laborious, and perhaps unappreciated, work of cataloguing the stars. W. E. P.

SYNTONIC WIRELESS TELEGRAPHY.

MR. MARCONI'S lecture on "Syntonic Wireless Telegraphy," recently delivered before the Society of Arts, gives an admirable and most interesting description of the system which he has developed and of the steps by which the development has been effected. "I have come to the conclusion," said Mr. Marconi, "that

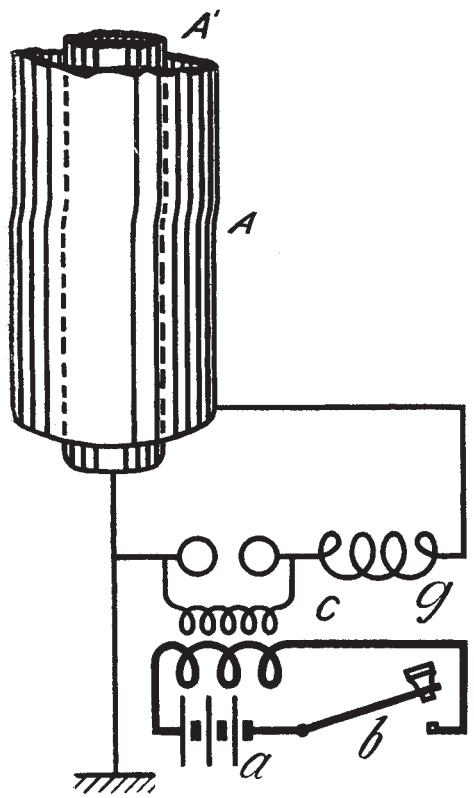

FIG. 1.

the days of the non-tuned system are numbered." If this prophecy be correct the non-tuned system has had, as was indeed expected, but a short life; but even in the few years that it has been in use it has accomplished much, having already to a certain extent greatly increased the pleasure and, above all, the safety of travelling by sea. There can be no better evidence of the general utility of wireless telegraphy than that the time has already arrived when the imperfections of the untuned system are making themselves felt. To quote Mr. Marconi again, "The ether about the English Channel has become exceedingly lively, and a non-tuned receiver keeps picking up messages from various sources which very often render unreadable the message one is trying to receive." That this confusion of messages would sooner or later occur many prophesied in the early days of the art, but few, we think, seriously believed that it would come about so soon. Fortunately, now that the evil is beginning to be felt, Mr. Marconi is ready with the remedy, a well-worked-out and trustworthy system of tuned transmitters and receivers.

The original form of Mr. Marconi's transmitting arrangement is too well known to need illustration: it consisted of an induction coil the secondary terminals of which were connected to a spark gap between two brass balls, one of these being earthed and the other connected to a long aërial conductor. Such a transmitter has a very low electrical capacity, and its radiating power is comparatively great. As a result, the oscillations which take place are considerably damped, and all the energy is radiated in one or two strong swings. Any receiving apparatus in the neighbourhood which is sufficiently sensitive will respond to these radiations even although its natural time of vibration differs greatly from that of the transmitter. Selection of messages with this arrangement is possible, to a limited extent, by using aërial conductors of considerably different lengths and

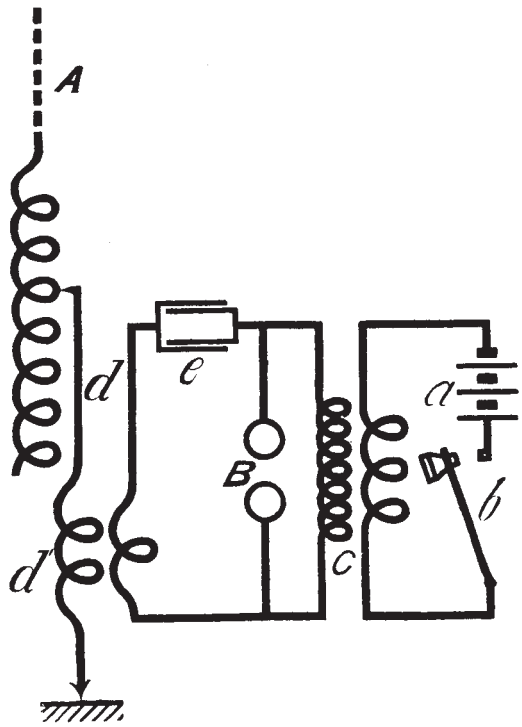

FIG. 2.

by winding the induction coils on the receiving apparatus with the length of wire necessary for correct resonance. But although this answers when the two or more transmitting stations are at different distances from the receiving station, it has been found not to work satisfactorily when the distances are equal.

It is necessary, therefore, to employ some form of radiator in which the oscillations are less damped and which will therefore emit a train of waves instead of one or two strong vibrations. These feebler impulses, falling in succession upon a receiver having the same time of vibration, will get up a swing sufficiently strong to break down the high resistance of the coherer. If, however, the receiver is not in tune, the impulses will not tend to get up any swing, and, being individually too feeble to break down the coherer's resistance, no signal will be recorded. Such a radiator can be constructed as shown in Fig. 1, in which the aërial conductor takes the form of two concentric cylinders, the inner, A', being connected to earth and to one side of the spark gap, and the outer,